1. We have replaced some digits by letters in decimal notation of a positive 9-digits integer:

1AB4CC7AB

Both occurrences of the letter A represent the same digit, similarly both occurrences of the letter B represent the same digit and both occurrences of the letter C represent the same digit. Each of the letters A, B, C represents a different digit. Determine what digits correspond to the letters A, B and C, assuming that the examined 9-digits integer is divisible by 225. Find all solutions and give reasons why no other solution exists. Not only the correctness, but also the quality and speed of the procedure is scored.

2. Transform the following logical formula into disjunctive normal form:

\[ \neg ((x \land \neg u) \lor (x \land z \land \neg y)) \]

The symbols x, y, z, u denote logical variables, the symbol & stands for conjunction, \lor denotes disjunction, and \neg denotes negation of the variable x.

a) Find any solution.
b) Find a solution in the form of a disjunction with at most three clauses.

3. Design a deterministic finite automaton over the alphabet \{0, 1\} that accepts exactly words not having two identical trailing letters. For example, it accepts the words 1, 101, 111110, but it rejects the words 11, 100, 101011. Write the transition function of the automaton as a table and draw the automaton in the form of a transition diagram. Try to design the simplest possible automaton, that is, one with the smallest number of states.

4. The following program is given (the Pascal form and the C form are equivalent):

```pascal
program A;
var N, X: integer;
begin
  read(N);
  X := 0;
  while N > 0
  do begin
    X := X + 1 - N mod 2;
    N := N div 2
  end;
  write(X)
end.
```

```c
main() /* A */
{ int n, x;
  scanf( "%d", &n);
  x = 0;
  while (n > 0)
  { x = x + 1 - n%2;
    n /= 2;
  }
  printf( "%d", x);
}
```

a) What result do we get after computation with the input value \(N = 1025\)?
b) Determine for which input values \(N\) the result is the number \(X = 6\). Find the three smallest such \(N\) (if they exist).
c) Determine all input values \(N\) for which the result of the computation equals to the input value, that is, \(X = N\).