Microprocessor Based Systems. Exam of November 2, 2009.

A new lottery, WinForYou, has been presented recently, with the following rules:
- a player has to bet on 8 numbers between 1 and 16, plus one EXTRA NUMBER randomly chosen by the system between 0 and 255, and then the whole bet is stored in a database and is valid for the 4 draws of the day;
- winning bets are divided among 3 different types, based on how many of their chosen numbers match with the drawn numbers:
    - type A: bets which have either 8 or zero matches with drawn numbers, and with the corresponding EXTRA NUMBER also equal to the extra number which has been drawn;
    - type B: bets which have either 8 or zero matches with drawn numbers;
    - type C: bets which have at least 7 or at most 1 matches with drawn numbers;

    Clearly, all type A winning bets are also type B, and type C winning bets. Same for type B winning bets which are also of type C;
- the total amount of cash prize for the daily 4 draws is known in advance and is related to variable C;
- given R=C/4, for each of first, second and third draws of the day:
    - 25% of R to be equally shared among winning bets of type A
    - 25% of R to be equally shared among winning bets of type B
    - 50% of R to be equally shared among winning bets of type C
- the 4th draw accounts for a prize equal to C/4 plus the unassigned prizes of the first three draws. In other words, if for first, second and third draws there is no winner in one or more categories, then the corresponding portion of prize is moved to increment the total cash prize of the 4th draw of the day, while if there are not winners in some categories at the 4th draw, then the corresponding cash prizes are unassigned.

It is asked to write a program in 8086 assembly language to manage the database and to compute, according to the rules above, some values, as reported below. All computations have to be done using integer arithmetic, i.e. by truncating to integers each fractional value. The choice of the database support, besides the "minimal part" described by the text, is left to programmers' design and has to be explicitly declared as a part of the solution which will be submitted.

- C is the total amount of daily cash prize is defined as C DW ?
- Bets are at least 10 and at most 200 and are stored into an array defined as BETS DB N DUP (?,?,?), i.e. with each bet coded on three bytes as follows: first byte storing the EXTRA NUMBER, and the second two bytes storing the betted numbers in coded form, i.e. with a one in a column corresponding to each betted number and a zero for non betted number. For example, 0000000101111111, stands for the bet of 1 (i.e. rightmost first column with a one), 2 (second rightmost column with a one) , 3, (third rightmost column with a one), 4, 5, 6, 7 and 9
- Variables DRAW1 DB (?,?,?) , DRAW2 DB (?,?,?) , DRAW3 DB (?,?,?) , DRAW4 DB (?,?,?) , store the results of each draw, according the same above notation as of BETS.

Write a 8086 assembly program for:
1. Compute the amount of cash won by type A and B winners for each of the first 3 draws (22 points)
2. Compute the amount of cash won by type C winners for each of the first 3 draws (6 points)
3. Compute the amount of cash won by type A, B, C for the 4th draw (3 points)
4. Compute the amount of cash won by each bet at the end of the four draws i.e. at the end of the day (3 points)

Please consider that before passing to solve one point, all previous points must have been already solved.

Please use carbon copy and retain one copy for home implementation and debug. Please provide in your classroom submitted version several explanatory and significant comments.

THE FINAL RUNNING VERSION OF THE PROGRAM SHOULD INCLUDE DATA INPUT AND OUTPUT (KEYBOARD AND SCREEN) FOR DRAW1,2,3,4 AND FOR THE COMPUTED AMOUNTS OF CASH.