

# Automated Grade Book

Your assignment is to write a program that automates an instructor's grade book. This program processes commands to add student names, record and alter grades, calculate a final semester grade and print out the student information in different orders. The instructor (the user) interacts with the program through a simple command-based user interface.

## Input

1. The retained student information, generated in previous executions of this program, is input from file "Grades.dat" at the beginning of each execution of the program.
2. The commands from the instructor are input (in response to "user-friendly" prompts from the program) as single letters. The commands are discussed in detail in the Processing instructions below.

## Output

1. Responses to user commands are to be written to the screen, as described in the Processing instructions below.
2. A summary of each command's transaction must be written to a text file called "Grades.trn". You may determine the format of this file; it should be labeled and formatted clearly.
3. The output from command O (Output) should be printed to file "Grades.out", as described in the Processing instructions below.
4. The updated grade information must be saved to file "Grades.dat".

## Processing

The user commands are printed to the screen as a menu, and the user responds with a single-letter command. Some commands require the program to prompt the user to enter additional information. After each command is processed, the menu should be redisplayed. The commands are to be processed as described in the following table:

### COMMAND INSTRUCTIONS

- |   |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S | Set up for new semester. The program must prompt the user for the number of programming assignments (range 0 .. 6), the number of tests (range 0 .. 4), and final exams (range 0 .. 1). It must also prompt the user for the relative weights of programs, tests, and final exam in determining the students' grades. The relative weights are expressed as percentages of the semester grade, and must add up to 100%. |
| A | Add a student. The program must prompt the user for the student's name (last name and first name, strings of at most 20 characters), and student number (integer in the range 1 - 9999).                                                                                                                                                                                                                                |

- P Record programming assignment grade for all students. The program must prompt the user to ask which program number is to be recorded. Upon receiving a valid program number, the program must prompt the user with each student's name (processing them alphabetically), at which time the user inputs the program grade for that student. A valid program number is one that is less than numPrograms, and that has not been previously recorded. If the program number is not valid, print an appropriate error message.
- T Record test grade for all students. The program must prompt the user to ask which test number is to be recorded. Upon receiving a valid test number, the program must prompt the user with each student's name (processing them alphabetically), at which time the user inputs the test grade for that student. A valid test number is one that is less than numTests, and that has not been previously recorded. If the test number is not valid, print an appropriate error message.
- F Record Final exam grade for all students. The program must prompt the user with each student's name (processing them alphabetically), at which time the user inputs the final exam grade for that student. If final exam grades have been previously recorded, print a message.
- C Change a grade for a particular student. The program must prompt the user to get the student number, the new grade, and the type of grade to change (P, T, or F, as described above).
- G Calculate final grade. Add the program grades for each student and store the average in the student's record. Add the test grades for each student and store the average in the student's record.
- O Output the grade data, ordered alphabetically by name (last name/first name) or by student number (in increasing order). The name, student number, and grade book data must be printed out in the order indicated, to file "Grades.out". Format the data with appropriate labels.
- Q Quit. Save all the student record data to the "Grades.dat" file, and terminate the program.

NOTE: The S (Setup) command must be made (once per semester) before any of the other commands can be executed. If this command is made in a particular execution of the program, the "Grades.dat" input file should be ignored, and the grades data structure should be initialized to the empty state.

## Program Enhancement

Modify the O (Output grades) command to prompt the user to indicate in which order the grade data must be printed: alphabetically by name (last name/first name) or by student number (in increasing order).

## Data Structures

The design of the grade book data structure is an important part of this program. You may use any of the ADTs that we have discussed so far this semester. The "application" parts of your program may only access the data structure through the set of operations that are specified for the ADTs that you use. The more effective your use of abstract data types, the better your program (and your grade) will be.

# **ALGORITHM**

DECLARE THE CONSTANT VARIABLES (MAX\_STUDENTS), (MAX\_GRADES), (MAX\_TESTS), AND MAX\_ASSIGNMENTS.

DECLARE ALL VARIABLES.

SET STRUCTS FOR GRADE, TEST AND ASSIGNMENT.

SET STRUCT SETUP FOR NUMBER OF STUDENTS, NUMBER OF ASSIGNMENTS, NUMBER OF FINAL AND NUMBER OF TEST.

SET STRUCT FOR STUDENT INFORMATION(ID NUMBER, STUDENTS GRADE, TESTS AND FINAL).

SET THE FUNCTION PROTOTYPES .

START MENU.

START SETUP STRUCT.

START STUDENT STRUCT.

SET A WHILE LOOP FOR MENU CHOICE.

SET MAIN MENU OPTIONS.

S= SET UP FOR NEW SEMESTER.

A= ADD A STUDENT.

P= RECORD PROGRAMMING ASSIGNMENT.

T= RECORD TEST GRADES FOR ALL STUDENTS.

F= RECORD FINAL EXAM GRADE FOR ALL STUDENT.

C= CHANGE A GRADE FOR A PARTICULAR STUDENT.

G= CALCULATE GRADES.

O=PRINT.

V=VIEW.

Q=QUIT.

START THE FUNCTIONS.

## **SEMESTER SETUP:**

SET A WHILE LOOP TO SETUP THE NUMBER OF STUDENTS, ASSIGNMENTS, AND TESTS.

SET ANOTHER WHILE LOOP TO CHECK IF ASSIGNMENTS, TESTS, AND FINAL WEIGHT ARE EQUAL TO 100.

#### **ADD STUDENTS:**

SET IF STATEMENT TO CHECK IF THERE ARE AND ASSIGNMENTS NUMBER IF NOT, THE SEMESTER NEEDS TO BE SET UP.

SET FOR LOOP TO SEE IF ID NUMBER HAS NOT BEEN USED TWICE.

SET WHILE LOOP TO CHECK IF ID NUMBERS ARE <0 AND >9999.

#### **RECORD FINAL EXAM:**

SET WHILE LOOP FOR VALID GRADE NUMBER.

#### **RECORD PROGRAMMING SCORES:**

SET IF STATEMENT TO CHECK THE VALID ASSIGNMENT NUMBER.

SET ANOTHER IF STATEMENT TO CHECK IF GRADE HAS BEEN RECORDED.

SET WHILE LOOP FOR THE VALID GRADE NUMBER.

#### **RECORD TEST GRADES:**

SET IF STATEMENT FOR POSITIVE NUMBER.

SET ANOTHER IF STATEMENT FOR VALID TEST NUMBER.

SET ONE MORE IF STATEMENT TO CHECK IF THE TEST GRADE HAS BEEN RECORDED.

USED WHILE LOOP FOR VALID GRADE.

#### **CALCULATE GRADE:**

SET THE WHILE LOOP FOR TEST SUM, TEST AVERAGE, ASSIGNMENT SUM, FINAL AVERAGE, AND FINAL SUM.

SET THE FOR LOOP FOR TOTAL TEST GRADE.

DIVIDE TEST SUM BY TOTAL POINTS.

MULTIPLY BY TEST WEIGHT.

FINAL SUM = TEST TOTAL + ASSIGNMENT TOTAL + FINAL TOTAL.

SET IF STATEMENT FOR LETTER GRADE.

#### **UPDATE GRADES:**

SET THE IF STATEMENT FOR CORRECT STUDENT.

SET ANOTHER IF STATEMENT TO CHECK WHICH TEST NUMBER TO BE RECORDED.

SET ONE MORE IF STATEMENT FOR POSITIVE INTEGER.

#### **VIEW STUDENT INFORMATION:**

SET FOR LOOPS FOR NUMBER OF STUDENTS, NUMBER OF TESTS, AND NUMBER OF ASSIGNMENTS.

#### **GET INFORMATION FROM THE FILE:**

SET IF STATEMENTS TO OPEN THE FILES.

SET FOR LOOPS TO GET STUDENT LAST NAME, FIRST NAME, ID NUMBER FROM THE TEXT FILE.

SET MORE FOR LOOPS TO GET EACH STUDENT TEST SCORE, ASSIGNMENT SCORES, AND FINAL GRADE FROM THE TEXT FILE.

CLOSE THE TEXT FILE.

#### **SORT OUTPUT DATA:**

USED SELECTION SORT FOR SORTING.

#### **WRITE INFORMATION TO TEXT FILE:**

USED FOR LOOPS TO OUTPUT FILES.

CLOSED OUTPUT FILE.

Program    Input

```
13    totalStudent
6    Assignments
35    Assignments weight
1    recorded
1    recorded
0    not recorded
1    recorded
0    not recorded
1    recorded
4    Tests
30    Tests weight
1    recorded
1    recorded
0    not recorded
1    recorded
1    Exam
35    Exam weight
1    recorded
Smith
Sue
10    ID
90    Assignments#0
88    Assignments#1
0    Assignments#2
90    Assignments#3
0    Assignments#4
90    Assignments#5
80    Tests#0
90    Tests#1
0    Tests#2
80    Tests#3
90    Exam#0
65.1333    gradeTotal of Sue Smith
Dawson
John
29    ID
90    Assignments#0
89    Assignments#1
0    Assignments#2
88    Assignments#3
0    Assignments#4
90    Assignments#5
87    Tests#0
86    Tests#1
0    Tests#2
78    Tests#3
89    Exam#0
64.95    gradeTotal of John Dawson
Davis Jr.
Sammy
18    ID
53    Assignments#0
95    Assignments#1
0    Assignments#2
53    Assignments#3
```

0 Assignments#4  
44 Assignments#5  
33 Tests#0  
77 Tests#1  
0 Tests#2  
90 Tests#3  
87 Exam#0  
52.9917 gradeTotal of Sammy Davis Jr.

Kong  
King

13 ID  
94 Assignments#0  
91 Assignments#1  
0 Assignments#2  
98 Assignments#3  
0 Assignments#4  
100 Assignments#5  
98 Tests#0  
74 Tests#1  
0 Tests#2  
92 Tests#3  
83 Exam#0  
64.2917 gradeTotal of King Kong

Bears.

Da  
19 ID  
98 Assignments#0  
89 Assignments#1  
0 Assignments#2  
100 Assignments#3  
0 Assignments#4  
100 Assignments#5  
100 Tests#0  
99 Tests#1  
0 Tests#2  
95 Tests#3  
81 Exam#0  
65.85 gradeTotal of Da Bears

Bird

Larry

22 ID  
98 Assignments#0  
90 Assignments#1  
0 Assignments#2  
99 Assignments#3  
0 Assignments#4  
100 Assignments#5  
99 Tests#0  
72 Tests#1  
0 Tests#2  
93 Tests#3  
82 Exam#0  
64.1 gradeTotal of Larry Bird

Long

David

11 ID  
78 Assignments#0

92 Assignments#1  
0 Assignments#2  
77 Assignments#3  
0 Assignments#4  
77 Assignments#5  
78 Tests#0  
74 Tests#1  
0 Tests#2  
88 Tests#3  
84 Exam#0  
59.7 gradeTotal of David Long

Steve

Samules

27 ID  
77 Assignments#0  
88 Assignments#1  
0 Assignments#2  
90 Assignments#3  
0 Assignments#4  
93 Assignments#5  
80 Tests#0  
90 Tests#1  
0 Tests#2  
86 Tests#3  
78 Exam#0  
60.35 gradeTotal of Samules Steve

Wayne

John

21 ID  
69 Assignments#0  
93 Assignments#1  
0 Assignments#2  
65 Assignments#3  
0 Assignments#4  
66 Assignments#5  
82 Tests#0  
75 Tests#1  
0 Tests#2  
85 Tests#3  
85 Exam#0  
58.6167 gradeTotal of John Wayne

Chan

Charlie

15 ID  
67 Assignments#0  
96 Assignments#1  
0 Assignments#2  
84 Assignments#3  
0 Assignments#4  
33 Assignments#5  
87 Tests#0  
78 Tests#1  
0 Tests#2  
87 Tests#3  
88 Exam#0  
59.5083 gradeTotal of Charlie Chan  
Young



Paul

14 ID  
58 Assignments#0  
94 Assignments#1  
0 Assignments#2  
71 Assignments#3  
0 Assignments#4  
55 Assignments#5  
23 Tests#0  
76 Tests#1  
0 Tests#2  
90 Tests#3  
86 Exam#0  
53.7417 gradeTotal of Paul Young

Davis

Betty

17 ID  
74 Assignments#0  
98 Assignments#1  
0 Assignments#2  
77 Assignments#3  
0 Assignments#4  
11 Assignments#5  
71 Tests#0  
80 Tests#1  
0 Tests#2  
89 Tests#3  
90 Exam#0  
57.9917 gradeTotal of Betty Davis

Hammer

Mike

12 ID  
66 Assignments#0  
100 Assignments#1  
97 Assignments#2  
81 Assignments#3  
0 Assignments#4  
0 Assignments#5  
43 Tests#0  
86 Tests#1  
0 Tests#2  
99 Tests#3  
92 Exam#0  
56.2833 gradeTotal of Mike Hammer