MAE 8 - Spring 2022
Homework 5

Instructions: Follow the homework solution template. Put all answers in a MATLAB script named **hw5.m**. For this homework, you will need to submit multiple files. Create a zip archive named **hw5.zip**. The zip archive should include the following files: **hw5.m**, **assign_grade.m**, **days_in_month.m**, **studentA.mat**, **studentB.mat** and **studentC.mat**. Submit **hw5.zip** in CANVAS before 10 PM on Sunday 5/8/2022. Use double precision unless otherwise stated.

Problem 1:

Write a function **assign_grade.m** to compute total score and assign a letter grade based on the homework, midterm, project and final exam scores. The function should have the following declaration: **function [total_score, letter] = assign_grade(homework, midterm, project, final)** where the input **homework** is a 8-element vector to include the eight homework scores. The other inputs are single number which includes the scores of the midterm, project and final exam. The outputs are a single number **total_score** and a character-type string **letter**. The letter grade is assigned based on the total score. Use one of the following two formulas to compute the total score:

$$\text{total score} = 0.25 \times \frac{\text{sum of the best seven homework}}{7} \ldots + 0.25 \times \text{midterm} + 0.2 \times \text{project} + 0.3 \times \text{final}$$

$$\text{total score} = 0.25 \times \frac{\text{sum of the best seven homework}}{7} \ldots + 0.2 \times \text{project} + 0.55 \times \text{final}$$

The formula, which yields a higher total score, should be used to determine the output **total_score**. Remember to drop the lowest homework score before using the formula. Use the **total_score** to determine the output **letter** based on the following scheme:

A	≥ 93	B+	≥ 87	C+	≥ 77	D	≥ 60
A-	≥ 90	B	≥ 83	C	≥ 73	F	< 60
		B-	≥ 80	C-	≥ 70		

Remember to give the function a description. Download the following files from CANVAS: **studentA.mat**, **studentB.mat** and **studentC.mat**, and put them inside your current working folder. These files contain the homework, midterm, project and final exam scores of three sample students.

(a) Set **p1a = evalc('help assign_grade')**.

(b, c) Set **load('studentA.mat'); [p1b, p1c] = assign_grade(homework, midterm, project, final)**.

(d, e) Set **load('studentB.mat'); [p1d, p1e] = assign_grade(homework, midterm, project, final)**.

(f, g) Set **load('studentC.mat'); [p1f, p1g] = assign_grade(homework, midterm, project, final)**.

Note that different **studentA.mat**, **studentB.mat** and **studentC.mat** files will be used during grading.

Problem 2:

Write a function **days_in_month.m** to display the number of days in a given month. The function should have the declaration: **function days = days_in_month(month,leap)** where the input **month** is an all-lower-case string denoting the first three letters of the month. The input **leap** has logical value (0 or 1) indicating the leap year. The output **days** displays the number of days in the input month. February has 28 days (29 days in leap year). The following months have 30 days: April, June, September and November. Other months have 31 days. In cases where the inputs are invalid, the output **days** should be the string **'Invalid inputs'**. The function should include a description. Use **nested switch** statements.

(a) Set **p2a=evalc('help days_in_month')**.
(b) Set **p2b=days_in_month('jan',0)**.
(c) Set **p2c=days_in_month('feb',0)**.
(d) Set **p2d=days_in_month('feb',1)**.
(e) Set **p2e=days_in_month('apr',0)**.
(f) Set **p2f=days_in_month('aug',1)**.
(g) Set **p2g=days_in_month('oct',0)**.
(h) Set **p2h=days_in_month('nov',1)**.
(i) Set **p2i=days_in_month('Dec',0)**.

Problem 3: Italian mathematician Fibonacci is famous for introducing the 'Fibonacci series' to modern mathematics. Any term in the Fibonacci series is the sum of the previous two terms. For example, the first 5 terms of the series are

$$1, 1, 2, 3, 5$$

Use **for** loop to perform the following exercises.

(a) Compute the first 50 terms of the series and put the answer in vector **p3a**.

(b) Use **for** loop to compute the sum of all terms in the series in part (a). Put the answer in **p3b**.

(c) Find the ratio of two consecutive terms in the series in part (a) and put the answer in vector **p3c**. Hint: set p3c(1) = 0, p3c(2)=p3a(2)/p3a(1) and so on ...

Problem 4: Use **for** loop to compute the following expressions.

(a)

$$\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}}}}}}$$

Put the answer into **p4a**. Hint: The answer is approximately 2.

(b)

$$\sqrt{1+2\sqrt{1+2\sqrt{1+2\sqrt{1+2\sqrt{1+2\sqrt{1+2\sqrt{1+2\sqrt{1+2\sqrt{1}}}}}}}}}$$

Put the answer into **p4b**. Hint: The answer is approximately $1+\sqrt{2}$.

(c)

$$\sqrt{2-\sqrt{2+\sqrt{2-\sqrt{2+\sqrt{2-\sqrt{2+\sqrt{2-\sqrt{2+\sqrt{2-\sqrt{2}}}}}}}}}}$$

Put the answer into **p4c**. Hint: The answer is approximately $(\sqrt{5}-1)/2$.

Problem 5:

Download the file **survey.m** from CANVAS. The file includes the function **survey** which uses function **menu** to create a class survey. You are encouraged to explore how the function is constructed. Execute the function **survey** from the command window and take a short survey. Set Set **p5 = evalc('type(''survey.dat'')')** in the script. Do not execute the function inside your homework script. The function will generate a file named **survey.dat** which is to be included in your hw5.zip.