A09 · User-Defined Functions

Introduction

Assignment Goals

This assignment focuses on user-defined functions and nested structures. You will gain experience creating user-defined function and using nested structures to check inputs of those UDFs. This assignment focuses on MATLAB skill questions.

Successful Completion

This assignment has **2** problems. The deliverables list contains everything you are expected to submit individually.

Submit Problems 1 and 2 to the Gradescope online assignment **A09 – Skills Problems**		
Problem	**Type**	**Deliverables**
Problem 1: MATLAB Skills – UDFs	Individual	☐ Function m-file ☐ Requested results and information
Problem 2: MATLAB Skills – UDF and Nested Structures	Individual	☐ Function m-file ☐ Requested information and flowchart image

1. Read *Notes Before You Start*, on **Page 1**.
2. Read each problem carefully. You are responsible for following all instructions within each problem.
    a. There is no team planning component to this assignment.
3. Complete the problems using the problem-specific m-file templates provided in the assignment download. Replace *template* in the filename with your Purdue Career Account login
4. When your work is complete, confirm your deliverables are submitted to Gradescope.

Learning Objectives & Grading

This course uses learning objectives (LOs) to assess your work. You can find a list of the course LOs on Brightspace (Content > Key Course Info > Learning Objectives). Review the assignment grading for each problem in this assignment, which starts on **Page 4**. This outlines how your work will be graded for each problem.

Notes Before You Start

Helpful MATLAB Commands

Learn about the following built-in MATLAB commands, which might be useful in your solutions:

```
function, error, rem
```

Gradescope

You will submit all your deliverables to Gradescope for grading. This homework has **one** Gradescope submission assignment:

- **A09 – All Problems**: submit your deliverables for Problems 1 and 2

Problem Generator File

In the assignment folder, you will see a file named **A09_skills.p**. This is a MATLAB function file that generates problem information for each skill problem in this assignment.

Need help using this file? Refer to the *Notes Before You Start* of A04 or A05, or review the A00 Activity from Class 1B to see fully-worked examples.

Problem 1: MATLAB Skills – UDFs

Introduction

This problem requires you to write and run a user-defined function (UDF). You will submit your answers to an online assignment on Gradescope.

Problem Instructions

1. Type this command into the MATLAB Command Window prompt:

   ```
   >> A09_skills(PUID, 1)
   ```

   Remember to replace PUID with your 8-digit Purdue University ID number (leave off the leading 00).
2. Read the written instructions that appear in the Command Window. There are four (4) parts.
   a. Use the included template to write the requested function for Part A. Rename the template with your function name defined in Part A.
   b. Run your function to answer Parts B and C.
   c. Answer Part D **without** changing your function m-file from Part A. Enter only the function definition line in the box in Gradescope.
   d. Programming standards will not be assessed in this problem. Do not include comments in your solutions. Properly name the file.
3. Submit your work in Gradescope:
   a. Open Gradescope > **A09 – All Problems** and find the set of boxes that belong to **Q1** you want to submit. Enter the required information along with your answer:
      - ☐ **Function call**. Copy the command that you entered at the command prompt to call the function and paste the full command into this box. Be sure your PUID is included.
      - ☐ **Instruction text**. Copy the instruction text that is displayed in the Command Window. Paste it into this box. Include all text provided.
      - ☐ **Solutions**. Enter your function m-file and solutions. Follow any additional instructions provided.
   b. When you have entered all the required information for the question, click the **Save Answer** button.

Problem 2: MATLAB Skills – UDF and Nested Structures

Introduction

This problem requires you to read a flowchart that shows the coding plan for a user-defined function that contains a nested structure (where the flowchart contains as least one selection structure). You will submit your answers to an online assignment on Gradescope.

Problem

Instructions

1. Type this command into the MATLAB Command Window prompt:

   ```
   >> A09_skills(PUID, 2)
   ```

   Remember to replace PUID with your 8-digit Purdue University ID number (leave off the leading 00).

2. Read the flowchart in the figure window and the instructions that display to the Command Window.
   - You will need internet access to run this problem. The flowchart image is stored on a purdue.engineering.edu server. If this is a problem for you, contact your GTA and instructor for help.
   - Use the included template to write the requested function. Rename the template with your function name defined in the instruction text.
   - Translate the flowchart exactly as written, even if there are ways to achieve the same result.
   - The instructions will tell you if `out1` is expected to be a scalar or a vector.
   - Remember: if you divide an integer by 1, you will get a remainder of 0.
   - Programming standards will not be assessed in this problem. Use the single-letter variables used in the instruction text. Do not include comments in your solutions. Properly name your script.
   - Save an image file of your flowchart figure.
     a. Click **File > Save As** in the Figure Window.
     b. Select ***.png** as the file type. Name the file using the format A09Q2_flowchart_*login*.png, where *login* is your career account login

3. Submit your work in Gradescope:
   a. Open Gradescope > **A09 – All Problems** and find the set of boxes that belong to **Q2** you want to submit. Enter the required information along with your answer:
      - ☐ **Function call**. Copy the command that you entered at the command prompt to call the function and paste the full command into this box. Be sure your PUID is included.
      - ☐ **Instruction figure**. Submit your flowchart image file.
      - ☐ **Instruction text**. Copy the instruction text that is displayed in the Command Window. Paste it into this box. Include all text provided.
      - ☐ **Solutions**. Submit your function m-file. Follow any additional instructions.

   b. When you have entered all the required information for the question, click the **Save Answer** button.

Confirm Your Submission

You should save your progress on each question in a skills problem so that you do not lose your progress. To confirm your answers, click the **Submit & View Submission** button at the bottom of the questions in Gradescope (or select the assignment name from the Gradescope dashboard, if you have already saved your answers and navigated away from the original submission page).

Confirm that your submission for **A09 – All Problems** includes

- ☐ The function call and instructions for each skills question;
- ☐ The expected deliverables and results;
- ☐ Correct file names for any submitted files, including your Career Account login at the end where required.

You can resubmit your work as many times as you want, but only the final submission will be graded.

Assignment Grading

Your work will be graded using the evidences given in the course learning objectives. Familiarize yourself with the LOs and their evidences listed for each problem, which are below.

Find the list of the course LOs, with evidences, on Brightspace (Content > Key Course Info > Learning Objectives).

Problem 1

LOs: PC05, MAT05, EPS01

Problem 1 is worth 5 points. There is partial credit. The partial credit may be more specific than what is in the course LOs and is based on evidences in MAT05 and EPS01.

You must meet the PC05 expectations for each question. If you do not meet these, you will lose additional credit.

Evidence	Penalty
PC05 (1)	Lose full credit on problem
PC05 (2)	Lose 25% of full credit on problem
PC05 (3)	Lose 25% of full credit on problem
PC05 (4)	Lose 5% of full credit on problem

Problem 2

LOs: PC05, MAT05 and MAT06

Problem 2 is worth 5 points. There is partial credit. The partial credit may be more specific than what is in the course LOs and is based on evidences in MAT05 and MAT06.

You must meet the PC05 expectations for this problem. If you do not meet these, you will lose additional credit.

Evidence	Penalty
PC05 (1)	Lose full credit on problem
PC05 (2)	Lose 25% of full credit on problem
PC05 (3)	Lose 25% of full credit on problem
PC05 (4)	Lose 5% of full credit on problem