A10 · Team · User-defined Functions

Instructions

Assignment Goals

This assignment focuses on coordinating multiple user-defined functions and nested structures. Your team will create a set of user-defined functions that will work together to answer a context question. Your functions will following good programming standards.

Successful Completion

This assignment has one (**1**) problem. The deliverables list contains everything you are expected to submit.

Submit Problem 1 to the Gradescope programming assignment **A10 – Team**		
Problem	**Type**	**Deliverables**
Problem 1: Pool Volume UDFs	Team	☐ A10_poolVolume_*TeamID*.m ☐ A10_poolStandard_*login*.m ☐ A10_poolRamp_*login*.m ☐ A10_poolRound_*login*.m ☐ A10_poolOval_*login*.m* ☐ Data_manufacturer_testDims.csv

1. Read *Notes Before You Start*, on **Page 1**.
2. Read each problem carefully. You are responsible for following all instructions within each problem.
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 for the volume calculation functions. Replace *template* with your Team ID (for example, 001_14 for Team 14 in Section 001) for the poolVolume function.
4. When your work is complete, confirm your deliverables are submitted to Gradescope.

Notes Before You Begin this Assignment

Helpful MATLAB Commands

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

```
function, rem, floor, ceil, round, isscalar, any, all
```

Problem 1: Pool Volume UDFs

Introduction

This problem allows each member of the team to create one subfunction and then the whole team develop a final function to run the full program. You will complete this problem as a team. Note that the number of sub-functions will match the number of members on the team.

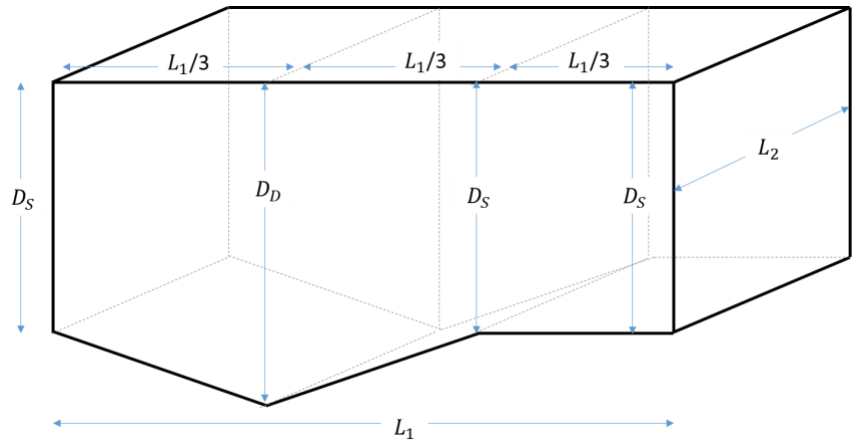
Re-watch the selection structures online module. In that module, you learned about creating a selection structure that calculates the volume of a hemisphere, rectangular prism, or cylinder. This problem requires your team to create a set of functions to perform a similar task.

Problem

Good water volume estimates are necessary for safe swimming pool maintenance. A swimming pool manufacturer has asked your team to develop a pool volume calculator for their customers. Your team will create one main function and a set of sub-functions to calculate and display the volume of 4 swimming pool shapes offered by the pool manufacturer.

The manufacturer offers four pool shapes:

1. The Standard Pool



L_1 is surface length

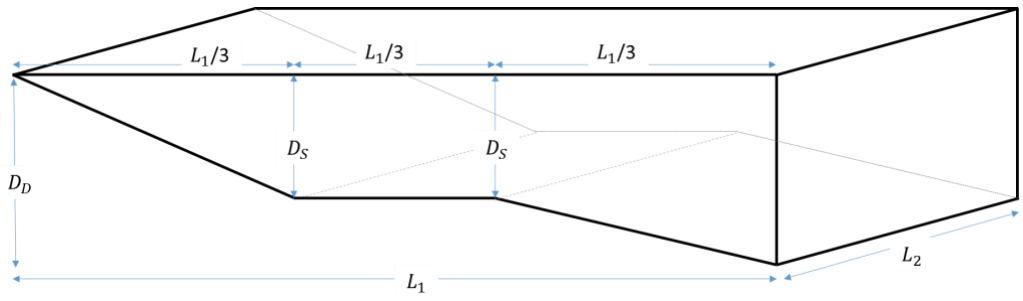
L_2 is surface width

D_S is the shallow end depth

D_D is the deep end depth

All measurements are in feet.

2. The Ramp Pool: a ramp entry into the shallow end and then a ramp bottom deep end



L_1 is surface length

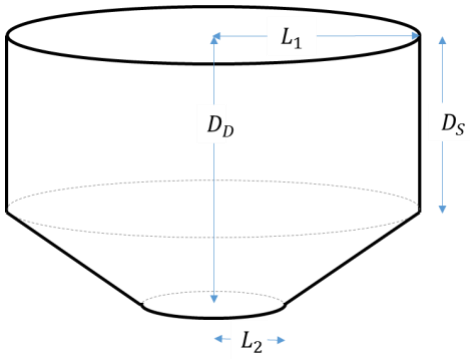
L_2 is surface width

D_S is the shallow end depth

D_D is the deep end depth

All measurements are in feet.

3. The Round Pool: a circular surface with a circular floor



L_1 is surface radius

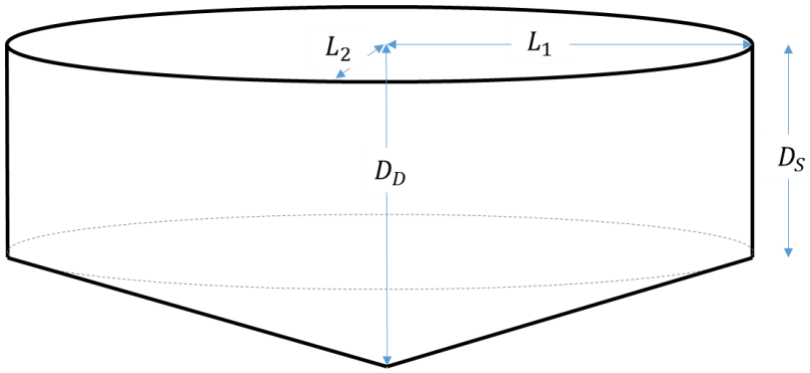
L_2 is bottom radius

D_S is the shallow end depth

D_D is the deep end depth

All measurements are in feet.

4. The Oval Pool: an oval surface with a fully slanted floor*



L_1 is semi-major axis of the surface ellipse

$L_2$is semi-minor axis of the surface ellipse

D_S is the shallow end depth

D_D is the deep end depth

All measurements are in feet.

Each team member is responsible for one sub-function (*__note__: three-person teams do not do the Oval Pool sub-function). The team can decide who writes which function. Each sub-function must meet the following requirements:

- Accept 4 scalar inputs: one for each of the four length measurements for the pool, in feet.
- Display a meaningful error if a negative number is entered as an input argument.
- Return 1 scalar output: the pool volume in gallons.
- Follow good programming standards.

The team then writes another function named A10_poolVolume_*TeamID*.m that calls the proper sub-function to display the pool volume to the Command Window. This function must meet the following requirements:

- Accept 1 string input: The name of the pool (one of Standard, Ramp, Round, or Oval*).
    - *Three-person teams: Do not include an option for an Oval Pool in this function
- Display a meaningful error message if the input pool name does not match the available pool shapes.
- Return no output arguments.
- Import pool dimension data from **Data_manufacturer_testDims.csv** to use as inputs in the sub-functions.
- Display the pool name and pool volume in gallons for only the pool requested in the input argument.
- Follow good programming standards.

Demonstrate your ability to call functions and show the results of your functions

Once all the functions are debugged and working properly, call the poolVolume function once for each of the pool types and once for an incorrect pool name. Copy and paste as comments the results for each function call to the `RESULTS` section of the poolVolume function.

Confirm Your Submission

Team deliverables

Confirm that your submission for **A10 – Team** includes

- ☐ The expected deliverables and results.
- ☐ Correct file names for any submitted files, including your Career Account login or Team ID at the end where required.
- ☐ **BE SURE TO INCLUDE ALL TEAM MEMBERS IN YOUR SUBMISSION**
- ☐ **Every team member**: confirm you were added to the team submission. You should receive an email from Gradescope when you are added or removed from a group submission. Check your email to ensure you were added as expected. Another check is to open the assignment in Gradescope to see your submission.

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

Do NOT upload any document not listed in the deliverables. Do not upload temporary versions of m-files (*.m~ or *.asv) – these files will be ignored by Gradescope and not included in your upload.

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. Each problem's assignment grading has a table and a flowchart. The table outlines what LOs will be used to grade your work and what point values are assigned to each evidence item. The flowchart outlines the grading process that a grader will use to assess your work.

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

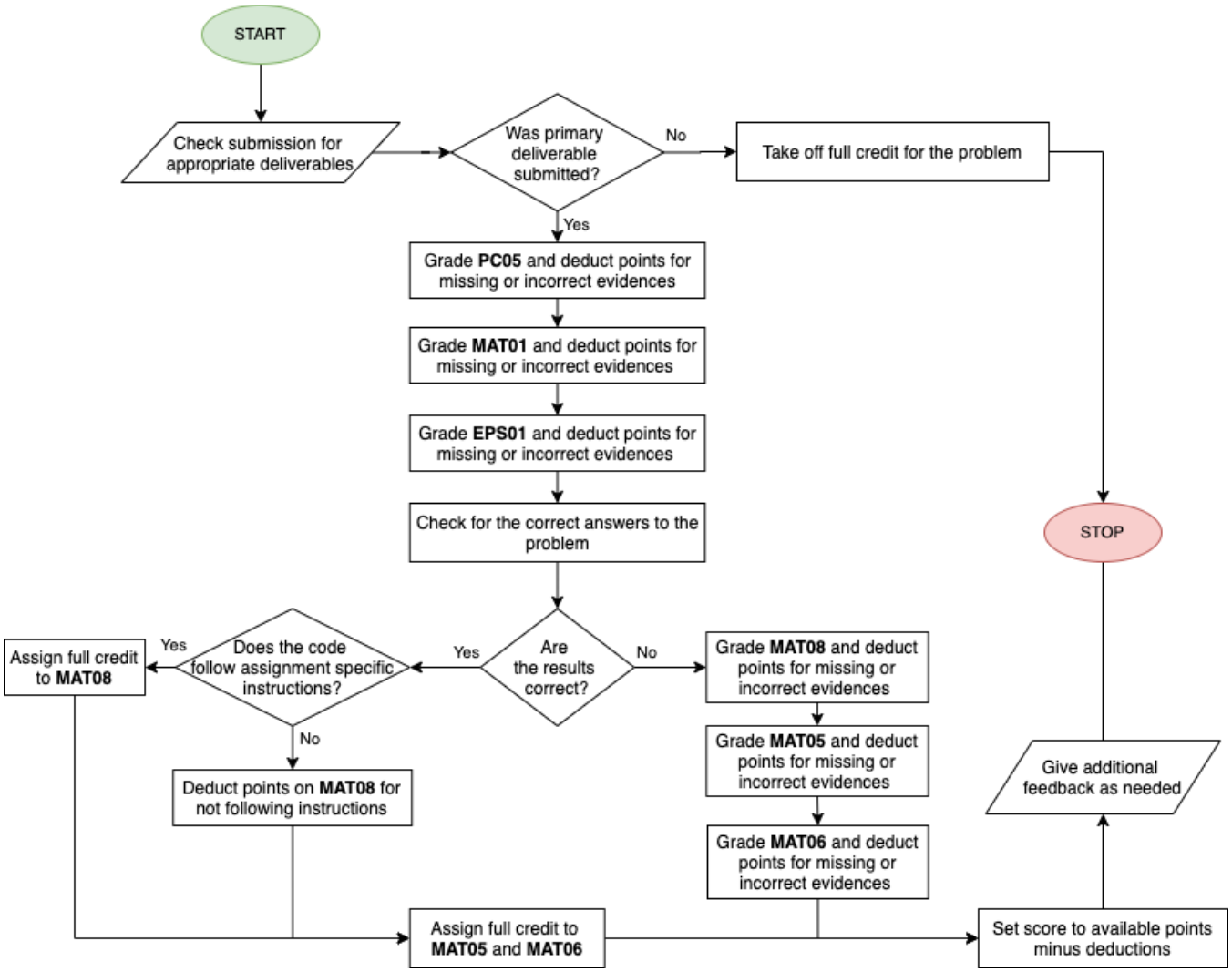
Pool Volume Function

LO Table

Note: PC05 evidences are only deductions since you are expected to follow the assignment instructions.

	PC05	MAT01	EPS01	MAT08	MAT05	MAT06
(1)	-6	0.25	0	0.5	0.4	0.2
(2)	-0.6	0	0	0.5	0.4	0.2
(3)	0	0	0.25	0.5	0.4	0.2
(4)	-0.3	0	0.25	0	0.25	0.2
(5)	-0.6	0	0.25	0	0.8	0.2
(6)	0	0	0	0	0	0
(7)	0	0	0	0	0	0
(8)	0	0.25	0	0	0	0

Grading Process



Sub-Functions

LO Table

Note: PC05 evidences are only deductions since you are expected to follow the assignment instructions. Note: missing one or more required subfunction will result in 0 credit for this part of the assignment.

	PC05	MAT01	MAT05	MAT06
(1)	-4	0.5	1	0.4
(2)	0	0	0	0.4
(3)	0	0	0	0.4
(4)	-0.4	0	0	0.4
(5)	-0.4	0.5	0	0.4
(6)	0	0	0	0
(7)	0	0	0	0
(8)	0	0	0	0

Grading Process