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 follow good programming standards.

Successful Completion

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

1. Read *Notes Before You Start*, on **Page 1**.
2. Read the problem carefully. You are responsible for following all instructions within the problem.
    a. The deliverables list within the problem contains everything you are expected to submit.
3. Complete the problems using the problem-specific m-file templates provided in the assignment download.
    a. Replace *template* in the filename with your Purdue Career Account login for the volume calculation functions (each teammate should complete one volume function).
    b. Replace *template* with your Team ID (for example, 001_14 for Team 14 in Section 001) for the poolVolume function.
4. Review your work using the learning objective evidences.
5. When your work is complete, confirm the team's deliverables are submitted to Gradescope.
    a. There is one assignment in Gradescope:
        i. Submit the team's work for this assignment to **A10 – Team (pool volume UDFs)**. Help link.
    b. You can resubmit your work as many times as you want; only the final submission will be graded.
    c. 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.
6. Late submissions are not allowed.

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.

Submission

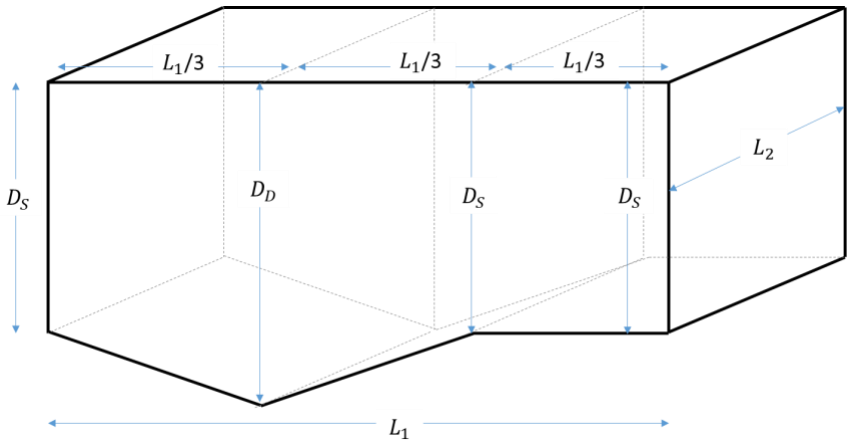
Gradescope Assignment	A10 – Team	Assignment Type	Team
Deliverables	☐ A10_poolVolume_*TeamID*.m ☐ A10_poolStandard_*login*.m ☐ A10_poolRamp_*login*.m ☐ A10_poolRound_*login*.m ☐ A10_poolOval_*login*.m (omit for teams of 3) ☐ Data_manufacturer_testDims.csv		

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

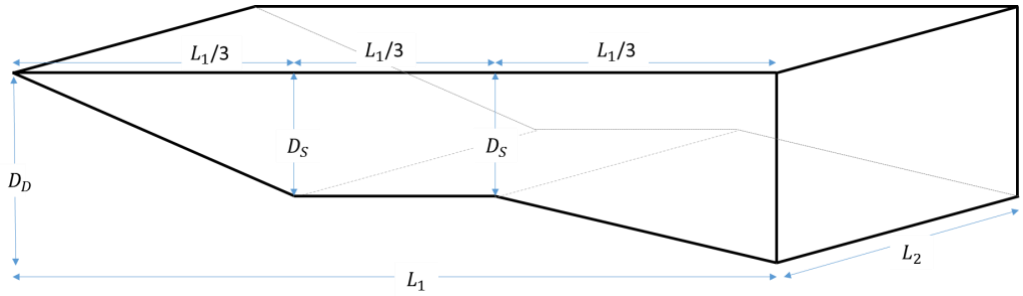
L_2 is surface width

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

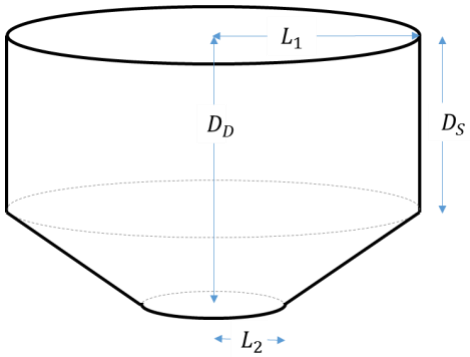
L_2 is surface width

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

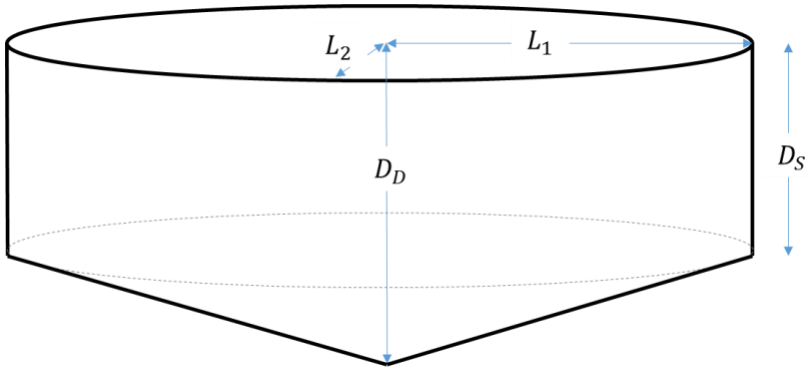
L_2 is bottom radius

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 pool 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 function name contains the career account login of the author.

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.

Submit your final deliverables

1. Select 1 team member to submit the assignment.
2. Open the Gradescope assignment and follow the instructions to add your files. Submit all deliverables at one time. If you need to resubmit, resubmit all deliverables together even if only one file changed.
3. Add all teammates to the group (Gradescope instruction link).
4. **All teammates**: confirm that you get an email confirming the submission and verify that you can see the submission in your Gradescope.

Grading

Pool Volume Function

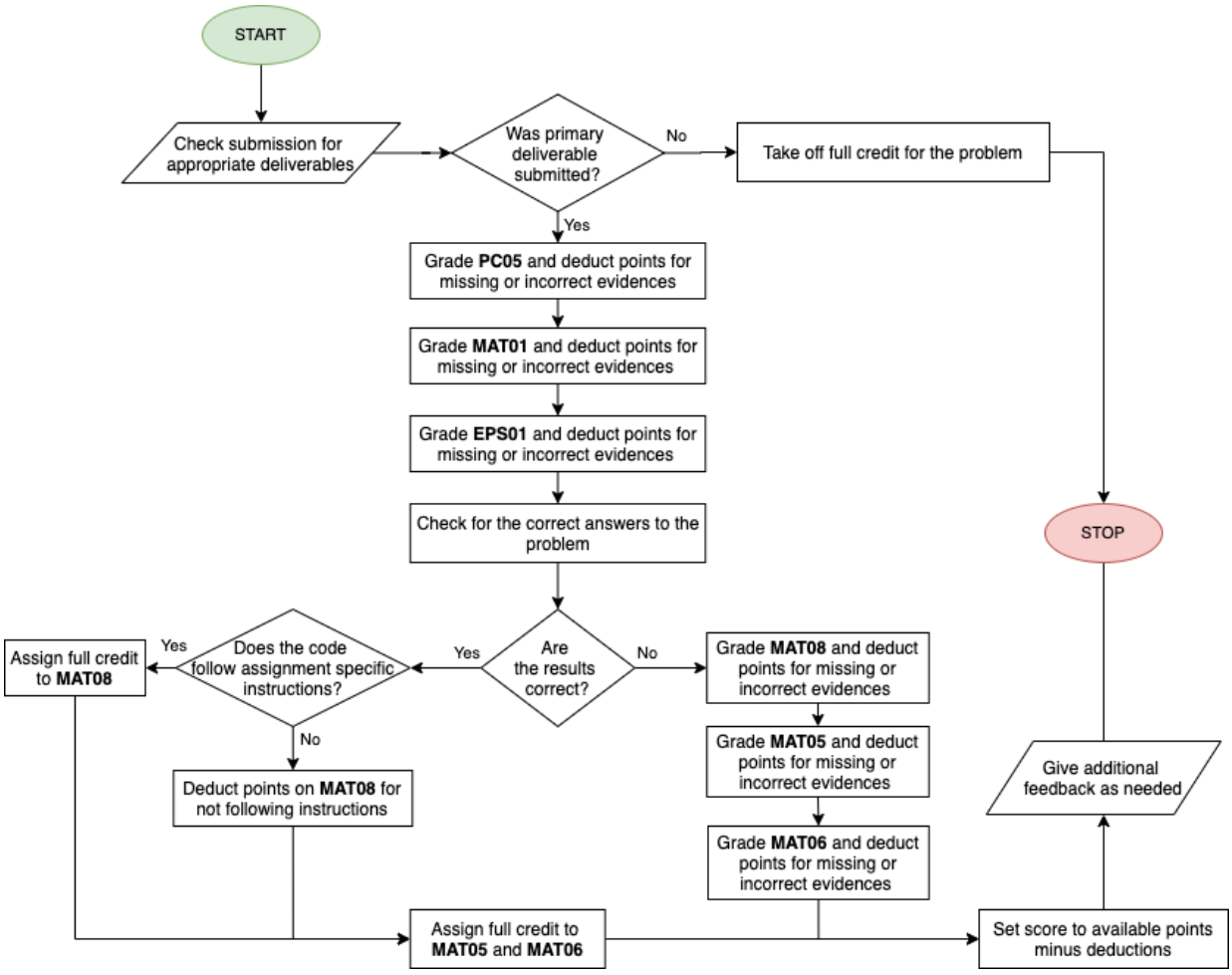
LOs: PC05, MAT01, EPS01, MAT08, MAT05, MAT06

Point value: 6 points. Partial credit is possible; see the LO table below for details. You must meet the PC05 expectations. If you do not meet these, you will lose additional credit

LO Table

	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

LOs: PC05, MAT01, MAT05, MAT06

Point value: 4 points. Partial credit is possible; see the LO table below for details. You must meet the PC05 expectations. If you do not meet these, you will lose additional credit.

NOTE: missing one or more required subfunction will result in 0 credit for this part of the assignment.

LO Table

	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