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**CIS115 Introduction to Programming and Logic**

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LAB 04 **DECISION STRUCTURES [PART 1]**

**SOLUTION**

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# Objectives

In this lab assignment, students will learn:

- How to use the if statement

- How to use the if-else statement

- How to compare strings

- How to use logical operators

# Goals

In this lab assignment, students will demonstrate the abilities to:

- Use the if statement

- Use the if-else statement

- Compare strings

- Use logical operators

# Instruction and Problems

Write a Python program for each of the problems in this lab. The following is an example.

*A bank requires customers to have a minimum salary of $30,000 and at least 2 years on the job to qualify for a loan. Write a program to check whether a customer qualifies.*

Python program:

\_\_author\_\_ = **'Man-Chi Leung'**

**#This program determines whether a customer qualifies for a loan**min\_salary = 30000.0

min\_years = 2

salary = float(input('Enter your annual salary: '))

years\_on\_job = float(input('Enter the number of years employed: '))

if salary >= min\_salary and years\_on\_job >= min\_years:

print('You qualify for the loan')

else:

print('You do not qualify for this loan')

Please use PyCharm to type and test your programs. Submit the Python files to Blackboard for credit. In this lab, you should submit 4 Python files, one for each problem.

## Problem 1

There are two exams in a programming course. Write a program to calculate a student’s total score. To encourage students to do better in the final exam, if a student has improved by more than 20 points from midterm to final, the student will receive 5 bonus points in the total. Write a Python program to do the following. Calculate and display total score before bonus. If a student receives extra points, display a text message about improvement bonus and new total score. The following are two examples.

Enter midterm score: 80

Enter final score: 85

Total Score: 165

Enter midterm score: 70

Enter final score: 95

Total Score: 165

5 bonus points added to total for meeting improvement target.

New total score: 170

Save the correct program in a file named **Lab04P1.py**. Submit the file to Blackboard for credit.

**Solution:**

\_\_author\_\_ = **'Man-Chi Leung'***# This program calculates the total of two eam scores.  
# If final score is more than 20 points higher than midterm score,  
# 5 bonus points will be added to the total.*midterm = float(input(**'Enter midterm score: '**))  
final = float(input(**'Enter final score: '**))  
total = midterm + final  
print(**'Total score:'**, total)  
  
improvement = final - midterm  
**if** improvement > 20:  
 print(**'5 bonus points added to total for meeting improvement target.'**)  
 total = total + 5  
 print (**'New total score:'**, total)

## Problem 2

A town uses a two-tier system to calculate bill for water usage. For the first 8000 gallons, it is $0.004 per gallon. After the first 8000 gallons, the rate will be $0.007 per gallon. Suppose a customer uses 8500 gallons of water. He will pay $0.004 per gallon for the first 8000 gallons, and $0.007 per gallon for the last 500 gallons. Write a Python program to determine how much a customer needs to pay. Ask the user how much water he has used. Calculate and display the water bill. The following are two examples.

Enter gallons of water used: 2100

Please pay this amount: $8.4

Enter gallons of water used: 8500

Please pay this amount: $35.5

Save your Python program in a file named **Lab04P2.py**. Submit the file to Blackboard for credit.

**Solution:**

\_\_author\_\_ = 'Man-Chi Leung'

# This program calculates water bill.

water\_usage = float(input('Enter gallons of water used: '))

if water\_usage <= 8000:

water\_bill = water\_usage \* 0.004

else:

water\_bill = 8000 \* 0.004 + (water\_usage - 8000) \* 0.007

print ('Please pay this amount: $', water\_bill)

## Problem 3

We saw a program about determining the number of BTU needed to cool a room before. The program asks the user to enter the room’s length, width and height, and uses the following formula to calculate the number of BTU needed:

BTU needed = room volume \* 3.5

Now we want to add one more consideration. If the room gets a lot of sunlight, number of BTU needed will increase by 20%. The program needs to ask the user whether the room gets a lot of sunlight. The user answers ‘yes’ or ‘no’. Adjust the number of BTU needed if necessary. The following are two examples.

Enter room length: 15

Enter room width: 12

Enter room height: 10

Does the room get a lot of sunlight? [yes/no] no

BTU needed for the air conditioner: 6300

Enter room length: 15

Enter room width: 12

Enter room height: 10

Does the room get a lot of sunlight? [yes/no] yes

BTU needed for the air conditioner: 7560

Save your Python program in a file named **Lab04P3.py**. Submit the file to Blackboard for credit.

**Solution:**

# This program calculates BTU needed to cool a room.

room\_length = float(input('Enter room length: '))

room\_width = float(input('Enter room width: '))

room\_height = float(input('Enter room height: '))

room\_volume = room\_length \* room\_width \* room\_height

btu\_needed = room\_volume \* 3.5

sunlight = input('Does this room get a lot of sunlight? [yes/no] ')

if sunlight == 'yes':

btu\_needed = btu\_needed + btu\_needed \* 0.2

print('BTU needed for this room:', btu\_needed)

## Problem 4

North Carolina state law requires all children to ride in a booster seat until either the child has reached age 8 or has exceeded 70 pounds. Write a program to determine whether a child needs to ride in a booster seat. Ask the age and weight of the child, then decide whether booster seat is required. The following are two examples.

Enter age: 7

Enter weight: 60

This child must use a booster seat.

Enter age: 7

Enter weight: 75

This child does not need a booster seat.

Save your Python program in a file named Lab04P4.py. Submit the file to Blackboard for credit.

**Solution:**

\_\_author\_\_ = **'Man-Chi Leung'***# This program determines whether a child needs booster seat*age = float(input(**'Enter age: '**))  
weight = float(input(**'Enter weight: '**))  
  
**if** age >= 8 **or** weight > 70:  
 print(**'This child does not need a booster seat'**)  
**else**:  
 print(**'This child must use a booster seat'**)

## Problem 5

Admission fee to an aquarium is $20. Children younger than 12 or members of military forces only pay half price. Write a program to determine how much a patron needs to pay. The following are three examples.

Please enter age: 25

Are you member of military forces? [yes/no] no

Please pay $20

Please enter age: 11

Are you member of military forces? [yes/no] no

Please pay $10

Please enter age: 25

Are you member of military forces? [yes/no] yes

Please pay $10

Save your Python program in a file named Lab04P5.py. Submit the file to Blackboard for credit.

**Solution:**

\_\_author\_\_ = **'Man-Chi Leung'***# This program determines admission fee to an aquarium*age = float(input('Please enter age: '))

military = input('Are you member of military forces? [yes/no] ')

military = military.lower()

if age < 12 or military == 'yes':

print('Please pay $10')

else:

print('Please pay $20')

# Grading rubric for Each Problem

Writing correct if/if-else statement [15 points]

Other statements [5 points]