

German University in Cairo
Media Engineering and Technology Faculty
Prof. Dr. Slim Abdennadher
Dr. Aysha Elsafty

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CSEN102: Introduction to Computer Science Winter Semester 2017-2018 Midterm Exam

Bar Code

Instructions: Read carefully before proceeding.

- 1) Please tick your major

		Major
		Engineering
		BI

- 2) Duration of the exam: 2 hours (120 minutes).
- 3) No books or other aids are permitted for this test.
- 4) This exam booklet contains 11 pages, including this one. Three extra sheets of scratch paper are attached and have to be kept attached. **Note that if one or more pages are missing, you will lose their points. Thus, you must check that your exam booklet is complete.**
- 5) Write your solutions in the space provided. If you need more space, write on the back of the sheet containing the problem or on the three extra sheets and make an arrow indicating that. **Scratch sheets will not be graded unless an arrow on the problem page indicates that the solution extends to the scratch sheets.**
- 6) When you are told that time is up, stop working on the test.

Good Luck!

Don't write anything below ; -)

Exercise	1	2	3	4	5	6	Σ
Possible Marks	8	8	8	12	12	14	62
Final Marks							

Exercise 1 Iterative Algorithms

(8 Marks)

Given the following Python program

```

list = eval(input())
sum = 0
i = 0
flag = True
while i < len(list):
    _ if list[i] == 6:
    _ _ flag = False
    _ elif list[i] == 7:
    _ _ flag = True
    _ elif flag:
    _ _ sum += list[i]
    _ i += 1
print(sum)

```

- a) Trace the above program for `list=[1, 2, 2, 6, 99, 14, 7, 8]`. You should clearly create a tracing table including all variables in the program above.

Solution:

list	sum	i	flag
[1, 2, 2, 6, 99, 14, 7, 8]	0	0	True
[1, 2, 2, 6, 99, 14, 7, 8]	1	1	True
[1, 2, 2, 6, 99, 14, 7, 8]	3	2	True
[1, 2, 2, 6, 99, 14, 7, 8]	5	3	True
[1, 2, 2, 6, 99, 14, 7, 8]	5	4	False
[1, 2, 2, 6, 99, 14, 7, 8]	5	5	False
[1, 2, 2, 6, 99, 14, 7, 8]	5	6	False
[1, 2, 2, 6, 99, 14, 7, 8]	5	7	True
[1, 2, 2, 6, 99, 14, 7, 8]	13	8	True

- b) What is the output of the program for any input n?

Solution:

The output of the program is the sum of all elements in the list except for those who occur in the list at a location between an element of value 6 and an element of value 7.

Exercise 2 Sequential Algorithms

(8 Marks)

We are given a number of cups of water. We want to distribute the water over the fewest number of containers, but we do not want to waste space by not filling a container. The containers we have come in gallon, quart, pint, and cup size.

- One gallon corresponds to 16 cups.
- One quart corresponds to 4 cups.
- One pint corresponds to 2 cups.

Write a Python program that given the number of cups, will print out the corresponding gallons, quarts, pints, and cups.

For example, if the the user enters 5 as the number of cups, the program should display:

```
0 gallons, 1 quarts, 0 pints, 1 cups
```

Solution:

```
cups = eval(input())
gallons = cups//16
cups = cups%16
quarts = cups//4
cups = cups %4
pints = cups //2
cups = cups %2
print(gallons, 'gallons', quarts, 'quarts', pints,'pints', cups, 'cups')
```

Exercise 3 Conditional Algorithms

(8 Marks)

Write a Python program that reads two integers representing a month and day and prints the season for that month and day.

Note the following:

- Summer is from the 20th of June until the 21th of September
- Autumn is from the 22nd of September until the 20th of December
- Winter is from 21st of December until the 19th of March
- Spring is from the 20th of March until the 19th of June

Solution:

```
month = eval(input("Input the month (e.g. January, February etc.): "))
day = eval(input("Input the day: "))

if month==1 or month==2:
    ↪ season = 'winter'
elif month==4 or month==5:
    ↪ season = 'spring'
elif month==7 or month==8:
    ↪ season = 'summer'
elif month==10 or month==11:
    ↪ season = 'autumn'
elif (month == 3) and (day > 19):
    ↪ season = 'spring'
elif (month == 6) and (day < 20):
    ↪ season = 'spring'

elif (month == 6) and (day > 19):
    ↪ season = 'summer'
elif (month == 9) and (day < 22):
    ↪ season = 'summer'

elif (month == 9) and (day > 21):
    ↪ season = 'autumn'
elif (month == 12) and (day < 21):
    ↪ season = 'autumn'
elif (month == 12) and (day > 20):
    ↪ season = 'winter'
elif (month == 3) and (day < 20):
    ↪ season = 'winter'

print(season)
```

Exercise 4 Iterative Algorithms

(12 Marks)

Write a Python program that solves the classic ancient Chinese puzzle that states the following:

We count the total number of heads and the total number of legs among the chickens and rabbits in a farm. How many rabbits and how many chickens do we have?

Your program should take the two integer inputs `heads` and `legs` corresponding to the number of heads and legs respectively, and output the number of rabbits and the number of chickens accordingly.

You must follow the printing format shown below for the input and output.

Example 1:

```
Enter the number of heads: 48
Enter the number of legs: 134
```

```
The number of chickens is: 29
The number of rabbits is: 19
```

Example 2:

```
Enter the number of heads: 35
Enter the number of legs: 94
```

```
The number of chickens is: 23
The number of rabbits is: 12
```

Example 3:

```
Enter the number of heads: 5
Enter the number of legs: 20
```

```
The number of chickens is: 0
The number of rabbits is: 5
```

Solution:

```
heads=eval(input("Enter the number of heads:"))
legs=eval(input("Enter the number of legs:"))

rabbit=0

while rabbit<=heads:
    _ chicken=heads-rabbit
    _ if(2*chicken + 4*rabbit == legs):
    _ _ print("The number of chickens is: ", chicken)
    _ _ print("The number of rabbits is: ", rabbit)
    _ _ break
    _ rabbit+=1
```

Solution of Exercise 4

Exercise 5 Iterative Algorithms

(12 Marks)

Write a Python program that takes as input a list A of numbers, and a number B. Your program should move the numbers of list A that are greater than or equal to B to the left, and move the numbers that are less than B to the right.

You are not allowed to create a new list. Your program should shuffle the numbers in the same list A, i.e shuffle in place. Your program should also display the updated list A at the end.

For Example,

- if the input list A is [6, 7, 2, 3, 8, 9] and the number B is 4 then the output (updated list A) could be
[6, 7, 8, 9, 2, 3]
- if the input list A is [1, 8, 2, 3, 7, 5, 6] and the number B is 5 then the output (updated list A) could be
[6, 8, 5, 7, 3, 2, 1]
- if the input list A is [1, 2, 6, 8, 3, 2] and the number B is 9 then the output (updated list A) would be
[1, 2, 6, 8, 3, 2]

Solution:

```
A=eval(input())
B=eval(input())

i=0
j= len(A)-1
while i<j:
    if A[i]<B and A[j]>=B:
        temp=A[i]
        A[i]=A[j]
        A[j]=temp
        j-=1
        i+=1
    elif A[j]<B:
        j-=1
    elif A[i]>=B:
        i+=1
print("The list is now:",A)
```

Exercise 6 Iterative Algorithms

(14 Marks)

Write a Python program that takes as input a list A and creates a new list B of the same elements of list A but shuffled in a random way.

For Example,

- running the program for the input list A = [0, 2, 4, 5], then the output list B could be:

[0, 4, 2, 5]

- running the program again for the same input list A = [0, 2, 4, 5], the output list B could also be:

[5, 2, 4, 0]

Solution:

```
import random
A=eval(input())
B=["temp"]*len(A)
i=0
while i<len(A):
    r=random.randint(0, len(A)-1)
    if B[r]=="temp"
        B[r]=A[i]
        i+=1
print(B)
```

Scratch paper

Scratch paper

Scratch paper
