实验报告 2

WA2214014 杨跃浙 人工智能 2 班

实验内容：

实验内容 1-Python 基本用法

1. 编写程序，输入任意大的自然数，输出各位数字之和。

2. 编写程序，输入两个集合 setA 和 setB，分别输出它们的交集、并集、差集 setA – setB。

3. 编写程序，输入一个自然数，输出它的二进制、八进制、十六进制表示形式。

4. 编写程序，输入一个包含若干整数的列表，输出一个新列表，新列表中只包含 原列表中的偶数。

5. 编写程序，输入两个分别包含若干个整数的列表 lstA 和 lstB，输出一 个字典，要求使用列表 lstA 中的元素作为键，列表 lstB 中的元素作为值， 并且最终字典中的元素数量取决于 lstA 和 lstB 中元素最少的列表的数量。

6. 编写程序，输入一个包含若干整数的列表，输出新列表，要求新列表中的所有元素来自于输入的列表，并且降序排列。

7. 编写程序，输入一个包含若干整数的列表，输出列表中所有的整数连乘的结果。

8. 编写程序，输入两个各包含 2 个整数的列表，分别表示城市中两个地点的坐标，输出两点之间的曼哈顿距离。

9. 编写程序，输入包含若干集合的列表，输出这些集合的并集。要求使用 reduce() 函数和 lambda 表达式完成。

10. 编写程序，输入等比数列的首项、公比（不等于 1 且小于 36 的正整数）和一个 自然数 n，输出这个等比数列前 n 项的和。关键步骤要求使用内置函数 int()

11. 编写程序，输入一个字符串，输出其中出现次数最多的字符及其出现的次数。要求使用字典。

实验内容 2-Python 常用序列

1. 编写程序，创建一个包含 1-10 之间的所有素数的列表。

2. 编写程序，创建一个包含 1-100 之间的所有偶数的列表。

3. 使用列表表示一个矩阵$\begin{pmatrix} 2 & -1 & 3 \\ -2 & 5 & 1 \end{pmatrix}$

4. 统计全班同学某门课程的及格率，使用列表表示成绩序列

scores=[78,69,53,97,88,31,74,92]

5. 从控制台读入 10 个学生分数，并放入到一个列表中。

6. 假设读入的分数中可能有些是无效的分数(<0,>100)，请从分数列表中删除这些无效分数。

7. 从控制台读入一个字符串，把它转换为列表，然后输出其中每一个元音字母{ a, e, o, i, u }出现的次数。

8. 从一个分数列表中选出>=60 的分数，构成一个及格成绩列表。

9. 编写程序，输入一个字符串，输出其中出现次数最多的字符及其出现的次数。要求使用字典（结合课件 PPT 的例子）。

实验原理:

1. 主要代码

实验内容 1-Python 的基本用法

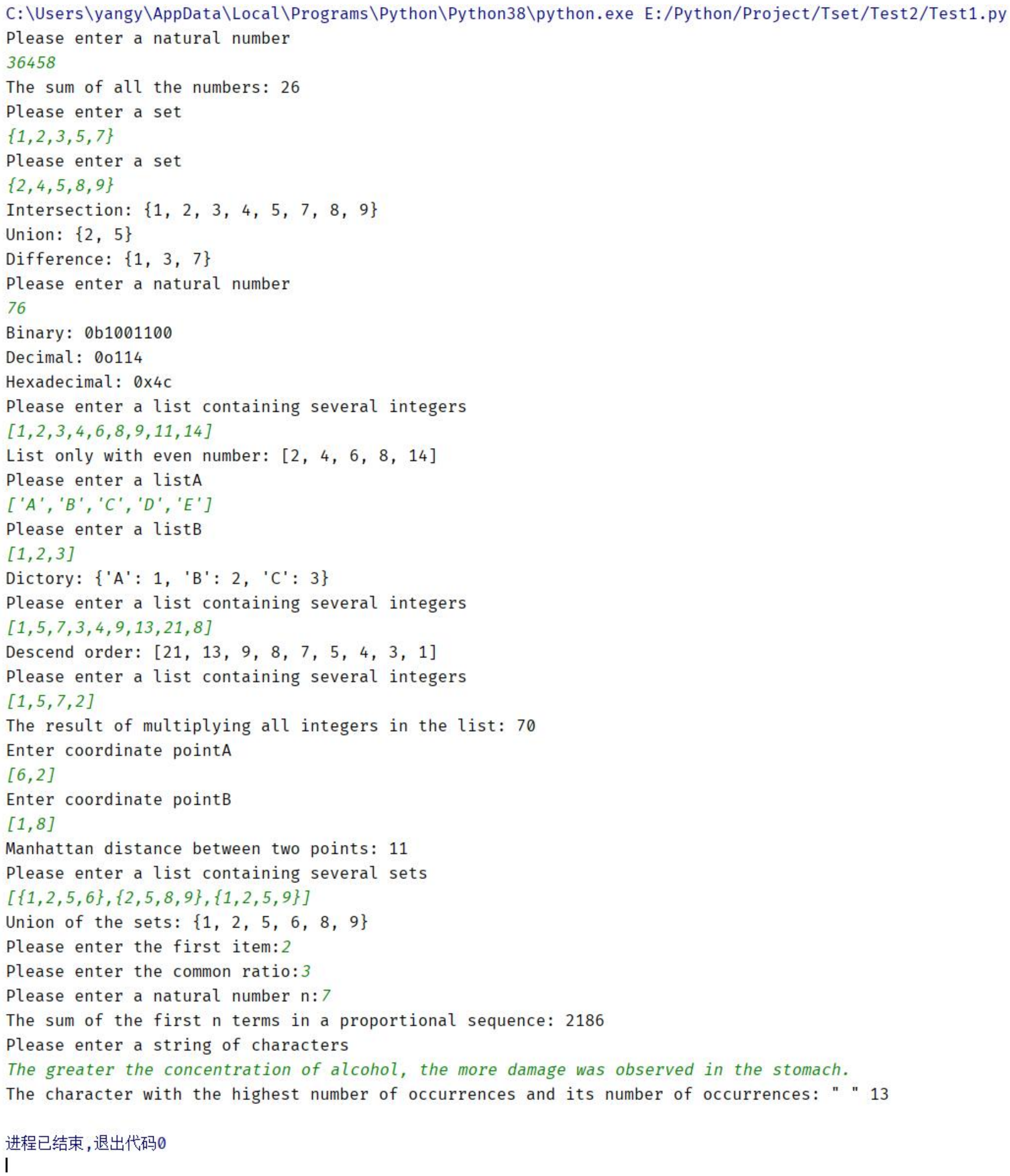
```
from functools import reduce
def test1():
    x=input("Please enter a natural number\n")
    print("The sum of all the numbers:",sum(map(int,x)))
def test2():
    setA = eval(input("Please enter a set\n"))
    setB = eval(input("Please enter a set\n"))
    print("Intersection:", setA | setB)
    print("Union:", setA & setB)
    print("Difference:", setA - setB)
def test3():
    x = int(input("Please enter a natural number\n"))
    print("Binary:", bin(x))
    print("Decimal:", oct(x))
    print("Hexadecimal:", hex(x))
def test4():
    lis=eval(input("Please enter a list containing several integers\n"))
    lis=list(filter(lambda x: x % 2 == 0,lis))
    print("List only with even number:",lis)
def test5():
    lisA=eval(input("Please enter a listA\n"))
    lisB=eval(input("Please enter a listB\n"))
    dictory = dict(zip(lisA,lisB))
    print("Dictory:",dictory)
def test6():
    lis= eval(input("Please enter a list containing several integers\n"))
    lis.sort(key=None, reverse=True)
    print("Descend order:",lis)
def test7():
    lis=eval(input("Please enter a list containing several integers\n"))
    result=reduce(lambda x,y:x*y,lis)
    print("The result of multiplying all integers in the list:",result)
def test8():
    pointA = eval(input("Enter coordinate pointA\n"))
    pointB = eval(input("Enter coordinate pointB\n"))
    distance = map(lambda x, y: abs(x - y), pointA, pointB)
    print("Manhattan distance between two points:", sum(distance))
def test9():
    sets=eval(input("Please enter a list containing several sets\n"))
    union_set=reduce(lambda x,y:x.union(y),sets)
    print("Union of the sets:",union_set)
def test10():
    a1 = int(input("Please enter the first item:"))
    q = int(input("Please enter the common ratio:"))
    n = int(input("Please enter a natural number n:"))
    sum = int(a1* (1 - q ** n) / (1 - q))
    print("The sum of the first n terms in a proportional sequence:",sum)
def test11():
    str = input("Please enter a string of characters\n")
    dic= {}
    for i in str:
        dic[i] = str.count(i)
    v = max(dic.values())
    for key, value in dic.items():
        if (value == v):
            print("The character with the highest number of occurrences and its
number of occurrences:",""+key+"", v)
if __name__ == '__main__':
    test1()
    test2()
    test3()
    test4()
    test5()
    test6()
    test7()
    test8()
    test9()
    test10()
    test11()
```

实验内容 2-Python 常用序列

```
def is_prime(n):
    if n < 2:
        return False
    elif n == 2:
        return True
    else:
        a = int(n ** (1 / 2) + 1)
        for i in range(2, a + 1):
            if n % i == 0:
                return False
        return True
def test1():
    lst=[i for i in range(1,11) if is_prime(i)]
    print(lst)
def test2():
    lst=[i for i in range(1,101) if i%2==0]
    print(lst)
def test3():
    lst=[[2,-1,3],[-2,5,1]]
    print(lst)
def test4():
    scores = [78, 69, 53, 97, 88, 31, 74, 92]
    pa=sum(map(lambda score:score//60,scores))
    print('{:.2%}'.format(pa/len(scores)))
def test5():
    global x
    x=input("Please enter scores for ten students\n").split()
    x=list(map(int,x))
    print(x)
def test6():
    global x
    x=list(filter(lambda score:0<=score<=100,x))
    print(x)
def test7():
    str=input("Please enter a string\n")
    str=list(str)
    counta=str.count('a')+str.count('A')
    counte=str.count('e')+str.count('E')
    counti=str.count('i')+str.count('I')
    counto=str.count('o')+str.count('O')
    countu=str.count('u')+str.count('U')
    print("Number of occurrences of letter a:",counta)
    print("Number of occurrences of letter e:",counte)
    print("Number of occurrences of letter i:",counti)
    print("Number of occurrences of letter o:",counto)
    print("Number of occurrences of letter u:",countu)
def test8():
    scores=eval(input("Please enter scores for students\n"))
    scores=list(filter(lambda score:score>=60,scores))
    print(scores)
def test9():
    str = input("Please enter a string of characters\n")
    dic= {}
    for i in str:
        dic[i] = str.count(i)
    v = max(dic.values())
    for key, value in dic.items():
        if (value == v):
            print("The character with the highest number of occurrences and its
number of occurrences:",key, v)
if __name__ == '__main__':
    test1()
    test2()
    test3()
    test4()
    test5()
    test6()
    test7()
    test8()
    test9()
```

2. 运行结果

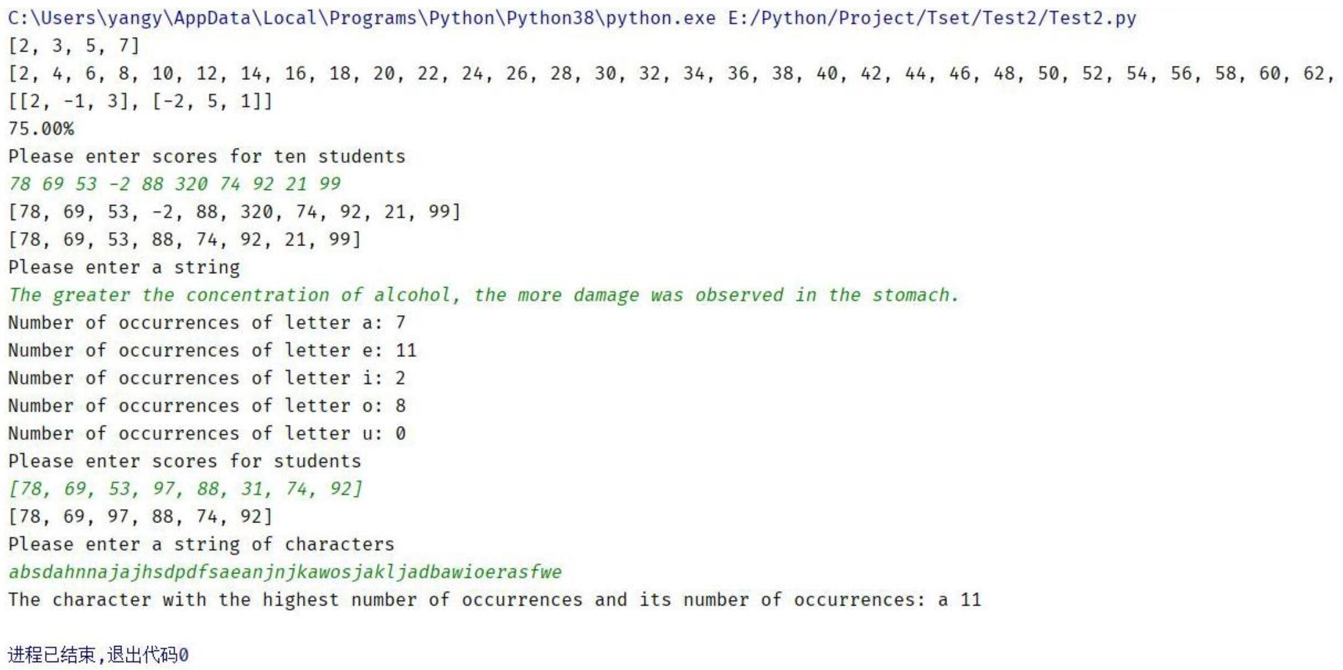
实验内容 1-Python 的基本用法



```
C:\Users\yangy\AppData\Local\Programs\Python\Python38\python.exe E:/Python/Project/Tset/Test2/Test1.py
Please enter a natural number
36458
The sum of all the numbers: 26
Please enter a set
{1,2,3,5,7}
Please enter a set
{2,4,5,8,9}
Intersection: {1, 2, 3, 4, 5, 7, 8, 9}
Union: {2, 5}
Difference: {1, 3, 7}
Please enter a natural number
76
Binary: 0b1001100
Decimal: 0o114
Hexadecimal: 0x4c
Please enter a list containing several integers
[1,2,3,4,6,8,9,11,14]
List only with even number: [2, 4, 6, 8, 14]
Please enter a listA
['A','B','C','D','E']
Please enter a listB
[1,2,3]
Dictory: {'A': 1, 'B': 2, 'C': 3}
Please enter a list containing several integers
[1,5,7,3,4,9,13,21,8]
Descend order: [21, 13, 9, 8, 7, 5, 4, 3, 1]
Please enter a list containing several integers
[1,5,7,2]
The result of multiplying all integers in the list: 70
Enter coordinate pointA
[6,2]
Enter coordinate pointB
[1,8]
Manhattan distance between two points: 11
Please enter a list containing several sets
[{1,2,5,6},{2,5,8,9},{1,2,5,9}]
Union of the sets: {1, 2, 5, 6, 8, 9}
Please enter the first item:2
Please enter the common ratio:3
Please enter a natural number n:7
The sum of the first n terms in a proportional sequence: 2186
Please enter a string of characters
The greater the concentration of alcohol, the more damage was observed in the stomach.
The character with the highest number of occurrences and its number of occurrences: " " 13

进程已结束,退出代码0
```

实验内容 2-Python 常用序列



```
C:\Users\yangy\AppData\Local\Programs\Python\Python38\python.exe E:/Python/Project/Tset/Test2/Test2.py
[2, 3, 5, 7]
[2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62,
[[2, -1, 3], [-2, 5, 1]]
75.00%
Please enter scores for ten students
78 69 53 -2 88 320 74 92 21 99
[78, 69, 53, -2, 88, 320, 74, 92, 21, 99]
[78, 69, 53, 88, 74, 92, 21, 99]
Please enter a string
The greater the concentration of alcohol, the more damage was observed in the stomach.
Number of occurrences of letter a: 7
Number of occurrences of letter e: 11
Number of occurrences of letter i: 2
Number of occurrences of letter o: 8
Number of occurrences of letter u: 0
Please enter scores for students
[78, 69, 53, 97, 88, 31, 74, 92]
[78, 69, 97, 88, 74, 92]
Please enter a string of characters
absdahnnajajhsdpdfsaeanjnjkawosjakljadbawioerasfwe
The character with the highest number of occurrences and its number of occurrences: a 11

进程已结束,退出代码0
```

小结与讨论:

实验内容 1-Python 的基本用法

题 1 中采用 map 函数处理。题 3 中 0b，0o，0x，分别代表二进制，八进制，十进制。题 4 中采用 filter 和 lambda 表达式，简单解决这个问题。题 5 中采用 zip 函数解决长度不一致的问题。题 7 中引入 reduce 函数。

实验内容 2-Python 常用序列

题 1 中编写 is_prime 函数，而后采用列表推导式解决。题 2 中输出的列表没有显示完全，但是题目较简单，所以后续列表就算了。题 3 中直接用列表形式表示矩阵，当然也可以采取外部库 numpy 等更好的表示矩阵。题 4 中以百分号形式，保留两位有效数字。题 5 中引入 global x，在题 6 中继续使用。题 7 中统计时应注意大小写。题 8 中引入 filter 函数。题 9 与实验 1 中题 11 一样。